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Experiment Station

MAPLE SUGARING WITH VACUUM PUMPING DURING THE FALL SEASON

Abstract.—Vacuum pumping of sugar maple trees during the late fall and early winter months is not advisable in northern Vermont. However, fall pumping may be profitable in other areas of the sugar maple range. It is recommended that the weather pattern in a given locale be observed; and if conditions are favorable, vacuum pumping should be tried on a small scale before attempting a larger operation.

Tapping of sugar maple trees for sap yields during the fall and early winter months is of questionable value. Some sugar maple producers in certain localities have reported collecting enough sap by gravity flow to make tapping profitable in November and December (*1*). In other areas, weather conditions have not been favorable for sap production at this time of year.

Two other adverse factors govern the success of fall tapping. Koelling (*3*) reported that in marginal fall tapping areas such as north-central Vermont, the sap-sugar concentration of fall-collected sap will be about 33 percent lower than the sap-sugar concentrations for the same tree as recorded for the spring sugaring season. Also, if fall sap volumes are high, spring sap volumes from the same tree are reduced.

Blum and Koelling (2) studied the vacuum technique as a means of collecting sap during the spring sugaring seasons. Based on the success of this spring vacuum research, we thought that using vacuum to pump sap from sugar maple trees during the fall might be practical.

A study was established in north-central Vermont for the purpose of evaluating fall vacuum pumping. Results indicated that sap yields

did increase, but based on the data we collected in Vermont, pumping in the fall was not practical. We must emphasize that fall tapping, with or without a vacuum pump, should be restricted to areas where weather conditions are generally favorable (freezing and thawing) and consistent from year to year.

Methods

An examination of past weather records for the study area indicated that temperatures were above and below freezing several times during November and December. These temperatures seemed to be suitable for maple sap flows.

A study was established in November 1968, using 16 trees. The trees were between 20 and 30 inches in diameter (d.b.h.). Each tree had two tapholes, which were drilled to a wood depth of 3 inches. The trees were tapped during the last week of October 1968 and again in the fall of 1969. One paraformaldehyde pellet was placed in each taphole.

One taphole was randomly selected for vacuum; the other taphole on the same tree was used for collecting sap by gravity. Sap from each vacuum taphole was collected in a 55-gallon drum, and a 20-gallon plastic container was used to collect sap from each gravity taphole (fig. 1).

Sap volumes were measured to the nearest 0.25 liters. We also measured the sweetness of the sap to the nearest 0.1 percent. A vacuum of 12 to 14 inches of mercury was maintained at the tapholes by a recirculating jet-type vacuum pump.

Sap Volume Yields

We were not successful in collecting much sap from sugar maple tapholes during either of the two fall seasons tested in this study. The ideal freezing and thawing weather conditions were very limited; once the temperatures dropped below freezing, very few thaw periods occurred.

During the 1968 fall season we ran the pump for a total of only 15 hours; and on a practical basis, we did not collect sufficient sap to make the operation profitable. The sap yields from the vacuum tapholes averaged 3 liters per tap, while the gravity setup averaged 1 liter per tap. Although the vacuum tapholes yielded 220 percent more sap than the gravity tapholes, this increase is not important because of the low volume yield per taphole.

Figure 1.—Sap-volume yields were collected for each taphole, using a 55-gallon drum for the vacuum yield and a 20-gallon container for the gravity yields.

Sap yields collected while the pump was shut off were also very low for the 1968 fall season. Gravity tapholes averaged about 8 liters per taphole, and the vacuum tapholes averaged nearly 9 liters per taphole. Fall sap yields from individual trees are extremely variable (table 1). Although vacuum pumping increased sap yields in all trees, the total amount varied from 0.5 liters to a maximum of 7.0 liters. This variation was also evident with gravity sap yields, but the extremes of volume yield were even greater—0.1 liters to 29.0 liters.

We did not collect any sap with the vacuum pump during the 1969 fall season, and the sap yields from both the vacuum and gravity tapholes were nearly zero. Sap-volume yields were low because the temperatures were below freezing during most of the fall season.

Table 1.—*Summary of vacuum and gravity sap yields collected from trees tapped during November and December 1968, in liters*

Tree number	Sap yields during pumping		Sap yields when pump turned off	
	Vacuum tapholes	Gravity tapholes	Vacuum tapholes	Gravity tapholes
11	1.8	0.2	0.6	1.4
17	3.2	.9	6.6	12.0
23	3.2	1.0	11.0	18.0
24	3.0	1.9	8.0	1.6
35	3.2	.3	4.0	2.4
36	1.2	.2	.2	.1
38	4.5	1.6	17.5	14.0
41	3.5	.4	4.8	3.0
48	1.0	.6	2.0	6.0
54	2.0	1.6	3.0	8.0
56	.5	.0	3.1	4.0
59	6.0	2.0	29.0	9.0
68	5.0	1.6	20.5	15.0
71	7.0	1.8	21.0	19.0
77	2.8	.8	4.0	6.5
81	3.5	1.1	7.0	11.0
Total	51.6	15.8	142.2	131.0
Average per taphole	3.2	1.0	8.9	8.2

Sap-Sugar Yields

The 1968 fall sap-sugar values were low, as expected. These values averaged 2.2 percent for both the vacuum and gravity tapholes. The same trees were also tapped during the spring seasons, and the average sugar readings of 3.5 percent strongly confirmed Koelling's previous research.

Conclusions

Although fall tapping can be made to work, and vacuum pumping seems to help, caution is advised in starting fall sugaring operations. Initially, trial setups on a small-scale basis should be attempted. This will allow the sap producer to determine whether the average fall weather conditions for his locality are such that a profitable fall sap season is possible. According to available information, it *is* possible to collect sap during the fall season in some areas; but there are also locales where fall tapping definitely cannot be recommended.

The sap producer should also realize that fall tapping is a more marginal operation than spring tapping for several reasons. First, the sap sweetness is lower in the fall, thus increasing overall evaporation costs. Also, the total sap volume may not be great enough to defray the costs of field installations and use of the sugarhouse. Another factor of possible importance is the potential of reduced spring sap yields as reported by Koelling.

Drilling new tapholes in the trees during both the fall and spring seasons can also lead to taphole spacing problems. Thus, tapping trees in the fall must be profitable or the producer is sacrificing good spring sap-producing wood.

Finally, vacuum pumping in the fall can increase yields, but our results indicated that there is also considerable variation from tree to tree. Some trees will not pay their way while others will. This is true for fall gravity systems, too. Keeping track of the sap yields of individual trees used in fall tapping is strongly advised.

Although we are expressing caution in tapping with vacuum or gravity during the fall and early winter season, some producers, such as those in the southern range of sugar maple, may find conditions highly favorable for sugaring during November and December. However, most producers in the northern portion of the sugar maple range will not be able to depend on consistent sap flows during the fall sugaring season.

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